General

Guideline Title

ACR Appropriateness Criteria® chronic ankle pain.

Bibliographic Source(s)

Luchs JS, Flug JA, Weissman BN, Kransdorf MJ, Appel M, Arnold E, Bancroft LW, Bruno MA, Fries IB, Hayes CW, Jacobson JA, Morrison WB, Mosher TJ, Murphey MD, Palestro CJ, Roberts CC, Rubin DA, Tuite MJ, Ward RJ, Zoga AC, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness CriteriaÂ® chronic ankle pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 9 p. [59 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Jacobson JA, Daffner RH, Weissman BN, Arnold E, Bancroft L, Bennett DL, Blebea JS, Bruno MA, Fries IB, Luchs JS, Morrison WB, Payne WK, Resnik CS, Roberts CC, Schweitzer ME, Seeger LL, Taljanovic M, Wise JN, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness Criteria® chronic ankle pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2009. 8 p.

Regulatory Alert

FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- December 14, 2016 – General anesthetic and sedation drugs : The U.S. Food and Drug Administration (FDA) is warning that repeated or lengthy use of general anesthetic and sedation drugs during surgeries or procedures in children younger than 3 years or in pregnant women during their third trimester may affect the development of children's brains. Consistent with animal studies, recent human studies suggest that a single, relatively short exposure to general anesthetic and sedation drugs in infants or toddlers is unlikely to have negative effects on behavior or learning. However, further research is needed to fully characterize how early life anesthetic exposure affects children's brain development.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Chronic Ankle Pain

Variant 1: Chronic ankle pain of any origin, best initial study.

Radiologic Procedure	Rating	Comments	RRL*
X-ray ankle	9		☢
Tc-99m bone scan ankle	1		☢☢☢
US ankle	1		O
CT ankle without contrast	1		☢
CT ankle with contrast	1		☢
CT ankle without and with contrast	1		☢
MRI ankle without contrast	1		O
MRI ankle without and with contrast	1		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Multiple sites of degenerative joint disease in the hindfoot detected by ankle radiographs. Next study.

Radiologic Procedure	Rating	Comments	RRL*
Image-guided anesthetic injection hindfoot/ankle	6		Varies
MRI hindfoot/ankle without contrast	5		O
CT hindfoot/ankle without contrast	4		☢
CT hindfoot/ankle with contrast	1		☢
CT hindfoot/ankle without and with contrast	1		☢
MRI hindfoot/ankle without and with contrast	1		O
X-ray hindfoot/ankle stress views	1		☢
Tc-99m bone scan hindfoot/ankle	1		☢☢☢
US hindfoot/ankle	1		O
CT arthrography hindfoot/ankle	1		☢
MR arthrography hindfoot/ankle	1		O
X-ray tenography hindfoot/ankle	1		☢
X-ray arthrography hindfoot/ankle	1		☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Ankle radiographs normal, suspected osteochondral injury. Next study.

Radiologic Procedure	Rating	Comments	RRL*
MRI ankle without contrast	9		O
CT arthrography ankle	6		☢
MR arthrography ankle	6		O
CT ankle without contrast	4		☢
MRI ankle without and with contrast	1		O
CT ankle with contrast	1		☢
CT ankle without and with contrast	1		☢
X-ray ankle stress views	1		☢
Tc-99m bone scan ankle	1		☢☢☢
US ankle	1		O
X-ray tenography ankle	1		☢
X-ray arthrography ankle	1		☢
Image-guided anesthetic injection ankle	1		Varies
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Ankle radiographs normal or nonspecific, suspected tendon abnormality. Next study.

Radiologic Procedure	Rating	Comments	RRL*
MRI ankle without contrast	9		O
US ankle	8		O
US-guided anesthetic injection ankle tendon	6		O
MRI ankle without and with contrast	3		O
X-ray ankle stress views	1		☢
Tc-99m bone scan ankle	1		☢☢☢
CT ankle without contrast	1		☢
CT ankle with contrast	1		☢
CT ankle without and with contrast	1		☢
CT arthrography ankle	1		☢
MR arthrography ankle	1		O
X-ray tenography ankle	1		☢
X-ray arthrography ankle	1		☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: Ankle radiographs normal or nonspecific, suspected ankle instability. Next study.

Radiologic Procedure	Rating	Comments	RRL*
MRI ankle without contrast	9		O
MR arthrography ankle	7		O
US ankle	6	Dynamic US imaging.	O
X-ray ankle stress views	5		☢
CT arthrography ankle	5		☢
MRI ankle without and with contrast	1		O
Tc-99m bone scan ankle	1		☢☢☢
CT ankle without contrast	1		☢
CT ankle with contrast	1		☢
CT ankle without and with contrast	1		☢
X-ray tenography ankle	1		☢
X-ray arthrography ankle	1		☢
Image guided anesthetic injection ankle	1		Varies
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 6: Ankle radiographs normal or nonspecific, suspected ankle impingement syndrome. Next study.

Radiologic Procedure	Rating	Comments	RRL*
MR arthrography ankle	6		O
US ankle	5	Dynamic US imaging.	O
CT arthrography ankle	5		☢
MRI ankle without contrast	5		O
MRI ankle without and with contrast	1		O
X-ray ankle stress views	1		☢
Tc-99m bone scan ankle	1		☢☢☢
CT ankle without contrast	1		☢
CT ankle with contrast	1		☢
CT ankle without and with contrast	1		☢
X-ray tenography ankle	1		☢
X-ray arthrography ankle	1		☢
Image-guided anesthetic injection ankle	1		Varies
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 7: Ankle radiographs normal, pain of uncertain etiology. Next study.

Radiologic Procedure	Rating	Comments	RRL*
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative**

Radiologic Procedure	Rating	Comments	RRL*
MRI ankle without contrast	9		O
US ankle	3	If focal symptoms are present.	O
MRI ankle without and with contrast	1		O
X-ray ankle stress views	1		☢
Tc-99m bone scan ankle	1		☢☢☢
CT ankle without contrast	1		☢
CT ankle with contrast	1		☢
CT ankle without and with contrast	1		☢
CT arthrography ankle	1		☢
MR arthrography ankle	1		O
X-ray tenography ankle	1		☢
X-ray arthrography ankle	1		☢
Image-guided anesthetic injection ankle	1		Varies
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 8: Suspected inflammatory arthritis detected by ankle radiographs. Next study.

Radiologic Procedure	Rating	Comments	RRL*
MRI ankle without and with contrast	9	See statement regarding contrast in text under "Anticipated Exceptions."	O
MR ankle without contrast	8		O
US ankle	5		O
CT ankle without contrast	1	Dual-energy CT for gout is excluded from consideration due to emerging data.	☢
CT ankle with contrast	1		☢
CT ankle without and with contrast	1		☢
CT arthrography ankle	1		☢
MR arthrography ankle	1		O
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

For assessing chronic ankle pain, there are multiple imaging options, including radiography, stress radiography, radionuclide bone scanning, ultrasound (US), computed tomography (CT), magnetic resonance imaging (MRI), and various injection procedures. Injection procedures include arthrography, CT arthrography, magnetic resonance (MR) arthrography, tenography, and diagnostic injection with anesthetic agents. While there are numerous causes for chronic ankle pain, common etiologies can include osteoarthritis, osteochondral injury, tendon abnormalities, ligament abnormalities and instability, and impingement.

Chronic Ankle Pain of Any Origin — Best Initial Study

Ankle pain is considered chronic when symptoms persist >6 weeks. Radiography should be considered as the initial imaging study. Radiographs may reveal osteoarthritis, calcified or ossified intra-articular bodies, osteochondral abnormalities, stress fractures, or evidence of prior trauma. Ankle effusions may also be identified in the anterior ankle joint recess by radiography with 53% to 74% accuracy. They are often associated with ligamentous injury or fracture. The presence of ossific fragments can indicate ligamentous injury or retinaculum avulsion, while periostitis can occur adjacent to tenosynovitis. Radiographs can also identify synovial osteochondromatosis and erosions from chronic synovitis. Routine radiographs of the ankle typically include anteroposterior, lateral, and mortise views, the latter obtained by internally rotating the foot 15 to 20 degrees. Weight-bearing radiographs may assist in the evaluation of hindfoot malalignment, though diagnosis cannot be made exclusively with this examination.

Multiple Sites of Degenerative Joint Disease in the Foot Seen on Ankle Radiographs

When degenerative changes of the ankle joint are diagnosed based on radiographs, MRI may be considered as the next best examination to evaluate cartilage integrity and associated soft tissues, such as ligaments and tendons, if these injuries are clinically suspected. However, when multiple sites of osteoarthrosis are present, it may be important to determine which joint is the cause of symptoms. Several reports have indicated the effectiveness of fluoroscopically guided anesthetic with or without corticosteroid injection of joints and tendon sheaths to identify a source of pain, which aids in surgical planning.

Suspected Osteochondral Injury with Normal Ankle Radiographs - Value of CT versus MRI

Osteochondral injuries may involve the talar dome and less commonly the tibial plafond and tarsal navicular bone. If this injury is associated with fracture, osseous cyst, or osteochondral defect, radiography (and bone scan) may show the abnormality; however, radiography often fails to show the extent of the osteochondral injury and will be initially negative if the injury is limited to the articular hyaline cartilage. One multimodality study showed that 41% of osteochondral abnormalities of the ankle were missed on radiography, while CT (noncontrast, multidetector with multiplanar reformatted images) and routine MRI performed similar to arthroscopy. MRI had the highest sensitivity (96%), but CT was more specific (99%). MRI is effective in determining osteochondral injury stability (sensitivity 97%), most commonly appearing as a high signal line deep to the osteochondral lesion on T2-weighted images, or less commonly a focal defect, an articular fracture, or an adjacent cyst. MRI has also been used to stage these lesions preoperatively with an accuracy of 81% and to assess osteochondral abnormalities after cartilage repair. The introduction of contrast into the ankle joint prior to MRI or CT will outline a cartilage surface defect, assisting in the assessment for instability. One study comparing CT arthrography and MR arthrography for talar cartilaginous lesions found an accuracy between 76% and 88% using MR arthrography compared to 90% to 92% for CT arthrography, suggesting that CT arthrography may be more reliable. High-resolution MRI using a microscopy coil can assist in detecting small, clinically relevant features of talar osteochondral lesions that may be missed on standard MRI, including osteochondral junction separation due to focal collapse of the subchondral bone, reparative cartilage hypertrophy, and bone separation in the absence of cartilage fracture. One study evaluating the role of single photon emission tomography (SPECT)/CT in assessing osteochondral defects in the ankle found that this study affected the surgeon's ultimate decision regarding treatment in 48% to 52% of cases as it allowed for improved evaluation of the subchondral bone and subchondral bone plate.

Suspected Tendon Abnormality with Normal or Nonspecific Ankle Radiographs

Possible tendon abnormalities include tenosynovitis, tendinopathy, tendon tear (partial or complete), and tendon subluxation or dislocation. Both MRI and US can effectively demonstrate ankle tendon abnormalities, although US results are more dependent on operator skill and expertise. It is generally accepted that MRI can achieve high sensitivities (>90%) in the diagnosis of ankle tendon tears; however, US can produce similar results, with one study showing that it had a sensitivity of 100% and an accuracy of 93% in diagnosing ankle tendon tears compared to surgical findings of 94% sensitivity and 90% accuracy. With regard to the tibialis posterior tendon, one study evaluating tendon pathology showed that US was slightly less sensitive than MRI; however, this difference did not significantly affect clinical management. With regard to peroneal tendinopathy and tendon tear, one study found the sensitivities and specificities of MRI to be 83.9% and 74.5%, respectively, for tendinopathy and 54.5% and 88.7%, respectively, for tendon tears. Another study using US showed 100% sensitivity and 90% accuracy in diagnosing peroneal tendon tears. With regard to chronic Achilles tendinopathy, US detected 21/26 and MRI 26/27 cases of tendinosis and partial rupture, and another study showed that US can differentiate full-thickness from partial-thickness Achilles tears with 92% accuracy.

One significant advantage of US over MRI is in the dynamic assessment for tendon subluxation and dislocation, with a reported positive predictive value of 100% compared to surgical findings, while MRI has a reported 66% accuracy rate for the same diagnosis. Diagnostic and therapeutic ankle tenography has also been used, with one study reporting that 47% of patients had prolonged relief of symptoms.

Suspected Ankle Instability with Normal or Nonspecific Ankle Radiographs

In the absence of findings on routine radiography, imaging options to evaluate ligamentous integrity include stress radiography, MRI, MR arthrography, CT arthrography, and US. One study evaluating anterior talofibular ligament injury demonstrated a diagnostic accuracy of 67% for stress radiography, 91% for US, and 97% for MRI when compared to arthroscopic findings. Additionally, US identified the exact location of the injury in 63% of cases compared to 93% for MRI. Another study comparing US and CT arthrography for diagnosing of anterior talofibular

ligament damage showed an accuracy of 61% using US and 71% for CT arthrography. MRI evaluation of anterior talofibular ligament and calcaneofibular ligament tears has demonstrated accuracies of 91.7% and 87.5%, respectively, when compared to arthroscopic findings. With regard to tears of the tibiofibular ligaments of the tibiofibular syndesmosis, MRI has a reported accuracy of 100%. While MRI can also demonstrate interosseous membrane tears, US has a proven sensitivity of 89% and specificity of 94.5% in diagnosing interosseous membrane tears shown at surgery. MRI offers the additional advantage of evaluating for injuries associated with or mimicking lateral instability that may not be diagnosed on stress radiography, such as tenosynovitis, tendon injury, and osteochondral lesions. MRI may also be used to evaluate the ankle after lateral ligament reconstruction.

Suspected Ankle Impingement Syndrome with Normal or Nonspecific Ankle Radiographs

Imaging can also be used to diagnose ankle impingement syndromes, which can occur in the anterolateral, anterior, anteromedial, posteromedial, and posterior aspects of the ankle joint. One study involving anterolateral ankle impingement compared US and CT arthrography to arthroscopic findings. The study found sensitivities and specificities of 77% and 57%, respectively, for US and 97% and 71%, respectively, for CT arthrography, a statistically significant difference. Studies on the accuracy of MRI in diagnosing anterolateral impingement syndrome have drawn different conclusions. One study suggested that this may be related to varying MRI magnet strengths and inconsistent protocols, and demonstrated sensitivities between 75% and 83% and specificity between 75% and 100%, with the axial images being the most important for the diagnosis.

MRI is useful in confirming the diagnosis, evaluating patients with an uncertain clinical diagnosis, and planning surgery. Additionally, it can help exclude other pathologic entities that may mimic or coexist with impingement syndromes. However, MRI features supportive of impingement may be present in asymptomatic individuals, and an accurate diagnosis requires careful correlation of imaging features with clinical features. US also showed abnormal soft tissues in anterolateral impingement, with a reported accuracy of 100% in one study. There are only limited reports on the use of MRI for the other forms of ankle impingement syndrome, so its accuracy in these conditions is not well established. MR arthrography has been found to be an accurate method for assessing both anterolateral and anteromedial impingement with the advantage of joint capsule distention by intra-articular contrast injection. US-guided injection has been shown as an effective treatment with posteromedial ankle impingement.

Suspected Stress Fracture

Stress fractures can also be a cause of chronic ankle pain (see the NGC summary ACR Appropriateness Criteria® stress [fatigue/insufficiency] fracture, including sacrum, excluding other vertebrae).

Pain of Uncertain Etiology with Normal Ankle Radiographs

When chronic ankle pain is of unclear etiology, normal ankle radiographs can be followed by other imaging tests, primarily directed by clinical findings. If the patient has a focal soft-tissue abnormality, both US and MRI can be considered. Peripheral nerve-related symptoms can be evaluated with US or MRI; however, US has the benefit of higher resolution. If symptoms are believed to originate from osseous structures, MRI or possibly bone scan can be considered, as well as CT if there is concern for fracture. CT has been shown to be superior to radiography for fracture detection. MRI is effective in detecting osseous stress injuries. Overall, MRI is the imaging test that globally evaluates all anatomic structures, including bone marrow. US with dynamic evaluation should be considered when symptoms are only present during specific movements or positions.

Suspected Arthritis

The majority of cases of ankle arthritis are post-traumatic in nature. However any of the common forms of arthritis can affect the ankle, including rheumatoid and seronegative arthritis. Radiography remains the initial and most important test for evaluating arthritis, but MRI can be helpful in evaluating the inflammatory arthropathies as it can detect the stigmata of the disease earlier, oftentimes when patients are still asymptomatic in the ankle joint. MRI with intravenous contrast can be particularly helpful in diagnosing the inflammatory arthropathies, especially if it is early in the disease course, and as a tool for visualizing pannus in rheumatoid arthritis and assessing the response to therapy. Similarly, US may be used to reliably diagnose these disorders.

Summary

- Initial evaluation of chronic ankle pain should begin with radiography.
- When a patient has multiple sites of degenerative change, pain relief after fluoroscopically guided anesthetic joint injection can indicate which joint is the source of symptoms.
- If there is concern for focal soft-tissue abnormality, such as tendon or ligament abnormality, MRI or US may be considered.
- Dynamic US should be considered in assessing any soft-tissue abnormality that requires specific joint movement or positioning to produce symptoms, such as with tendon subluxation.
- For suspected osseous abnormality, MRI, CT, and possibly bone scan can be used.

- Overall, MRI is the imaging method that globally evaluates all structures of the ankle.
- If there is concern for an intra-articular process such as osteochondral abnormality or ankle impingement, MR arthrography or MRI may be used, with the latter more effective in the presence of a joint effusion than when no effusion is present.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Abbreviations

- CT, computed tomography
- MR, magnetic resonance
- MRI, magnetic resonance imaging
- Tc, technetium
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢☢	0.1-1 mSv	0.03-0.3 mSv
☢☢☢	1-10 mSv	0.3-3 mSv
☢☢☢☢	10-30 mSv	3-10 mSv
☢☢☢☢☢	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Chronic ankle pain

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Family Practice

Internal Medicine

Nuclear Medicine

Orthopedic Surgery

Podiatry

Radiology

Rheumatology

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Podiatrists

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of radiologic examinations for patients with chronic ankle pain

Target Population

Patients with chronic ankle pain

Interventions and Practices Considered

1. X-ray
    - Ankle
    - Ankle stress views
    - Hindfoot/ankle stress views
2. Technetium (Tc-)99m bone scan
    - Ankle
    - Hindfoot/ankle
3. Ultrasound (US)
    - Ankle
    - Hindfoot/ankle
4. Computer tomography (CT)
    - Ankle without contrast
    - Ankle with contrast
    - Ankle without and with contrast
    - Hindfoot/ankle without contrast
    - Hindfoot/ankle with contrast

- Hindfoot/ankle without and with contrast

5. Magnetic resonance imaging (MRI)
    - Ankle without contrast
    - Ankle without and with contrast
    - Hindfoot/ankle without contrast
    - Hindfoot/ankle without and with contrast
6. Image-guided anesthetic injection
    - Hindfoot/ankle
    - Ankle
7. CT arthrography
    - Hindfoot/ankle
    - Ankle
8. MR arthrography
    - Hindfoot/ankle
    - Ankle
9. X-ray tenography
    - Hindfoot/ankle
    - Ankle
10. X-ray arthrography
    - Hindfoot/ankle
    - Ankle
11. US-guided anesthetic injection ankle tendon

Major Outcomes Considered

Utility of radiologic examinations in differential diagnosis

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 5 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis, and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence for all articles included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member forms his/her own opinion based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Modified Delphi Technique

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distributes surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The ratings are a scale between 1 and 9, which is further divided into three categories: 1, 2, or 3 is defined as "usually not appropriate"; 4, 5, or 6 is defined as "may be appropriate"; and 7, 8, or 9 is defined as "usually appropriate." Each panel member assigns one rating for each procedure per survey round. The surveys are collected and the results are tabulated, de-identified and redistributed after each round. A maximum of three rounds are conducted. The modified Delphi technique

enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive bias from fellow panelists in a simple, standardized and economical process.

Consensus among the panel members must be achieved to determine the final rating for each procedure. Consensus is defined as eighty percent (80%) agreement within a rating category. The final rating is determined by the median of all the ratings once consensus has been reached. Up to three rating rounds are conducted to achieve consensus.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is accepted as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic imaging procedures for evaluation of patients with chronic ankle pain

Potential Harms

Gadolinium-based Contrast Agents

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^{2}), and almost never in other patients. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the

type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Relative Radiation Level (RRL)

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Luchs JS, Flug JA, Weissman BN, Kransdorf MJ, Appel M, Arnold E, Bancroft LW, Bruno MA, Fries IB, Hayes CW, Jacobson JA, Morrison WB, Mosher TJ, Murphey MD, Palestro CJ, Roberts CC, Rubin DA, Tuite MJ, Ward RJ, Zoga AC, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness CriteriaÂ® chronic ankle pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 9 p. [59 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1998 (revised 2012)

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

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Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Musculoskeletal Imaging

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Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Jacobson JA, Daffner RH, Weissman BN, Arnold E, Bancroft L, Bennett DL, Blebea JS, Bruno MA, Fries IB, Luchs JS, Morrison WB, Payne WK, Resnik CS, Roberts CC, Schweitzer ME, Seeger LL, Taljanovic M, Wise JN, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness Criteria® chronic ankle pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2009. 8 p.

Guideline Availability

Electronic copies: Available from the American College of Radiology (ACR) Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 90 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria® chronic ankle pain. Evidence table. Reston (VA): American College of Radiology; 2012. 26 p. Electronic copies: Available in PDF from the ACR Web site.

Patient Resources

None available

NGC Status

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